Lvl1 EMCal trigger studies

Lvl1 trigger meeting 5/10/2002

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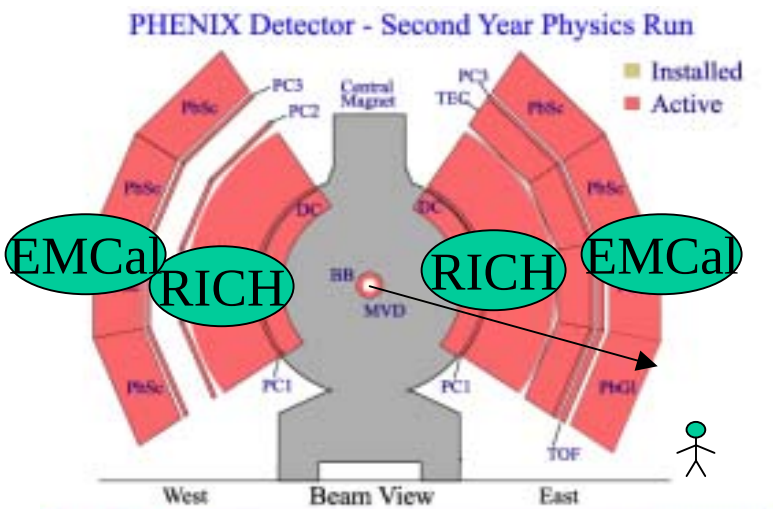
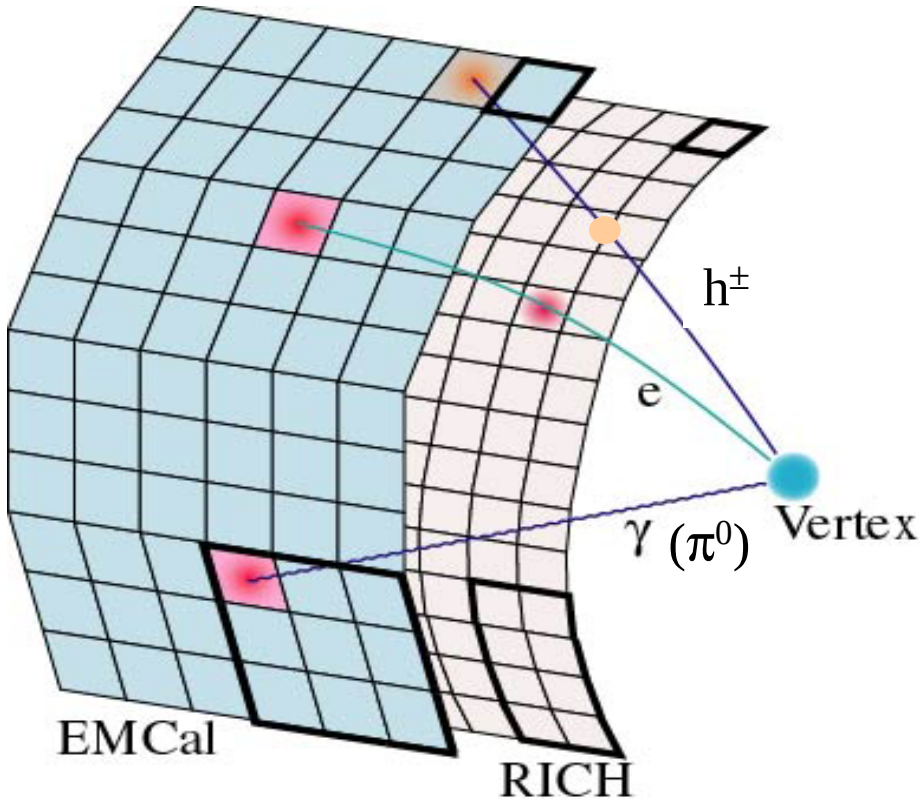
Concept of ERT



PHENIX central arm



To select high p_T particle, electron.

Rejection power ~100 was requested in 2002 spin run

averaged interaction trigger rate: ~20kHz

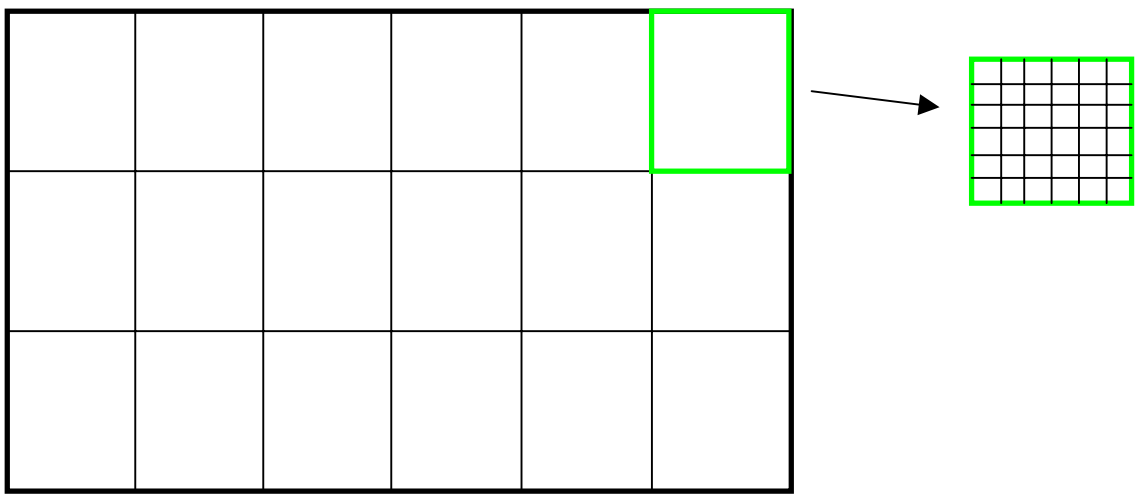
DAQ bandwidth: ~200Hz for ERT

EMCal trigger bit information

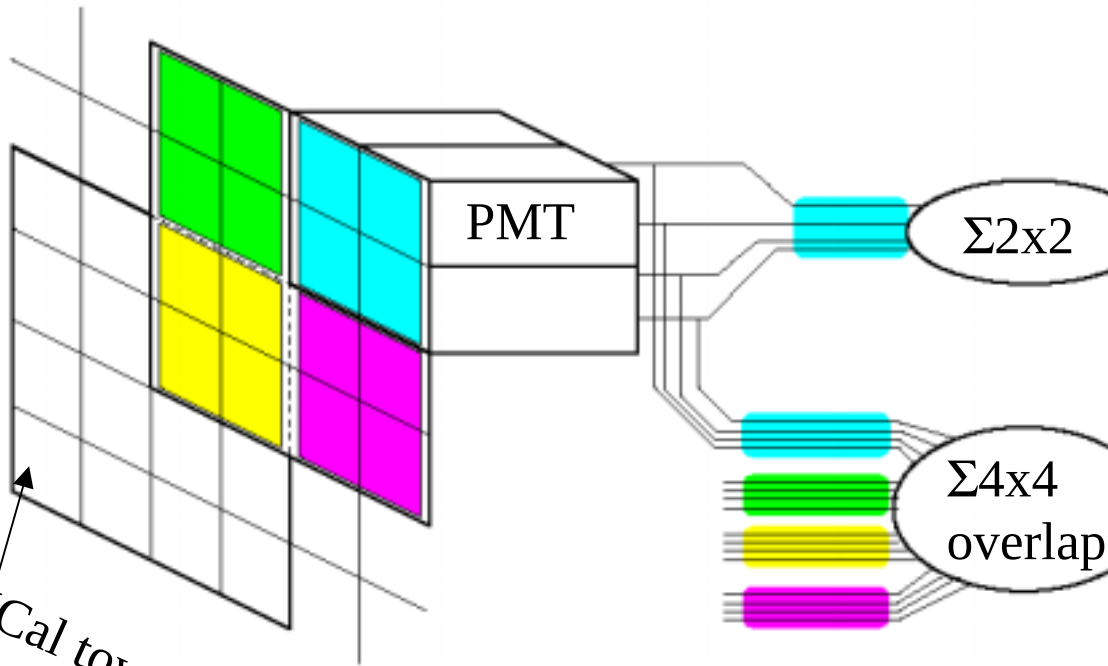
1 trigger bit / Super Module (SM)

Sector = 18 SM(PbSc)
= 32 SM(PbGl)

SM has 36 trigger units



EMCal trigger unit



Threshold

2x2

4x4a

4x4b

4x4c : not used in this run

EMCal tower 5.25*5.25cm(PbSc)
4*4cm (PbGl)
Total 15552 towers (PbSc) and
9216 towers (PbGl)

36 units/SM (both 2x2 and 4x4)

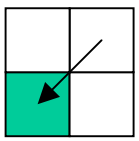
An mistake in 2002 spin run

——We forgot to connect each super module(SM) in PbSc. ——

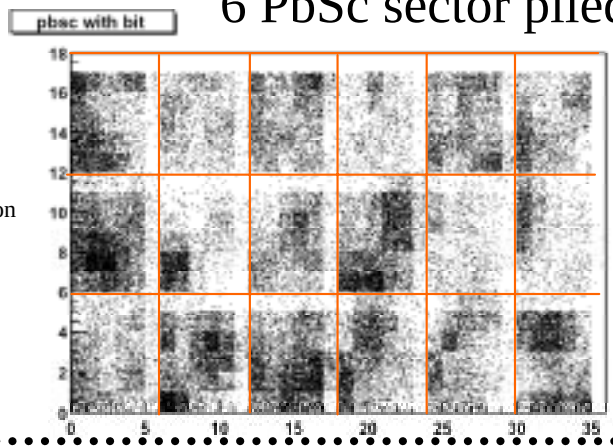
The largest energy tile position in SM with trigger bit.

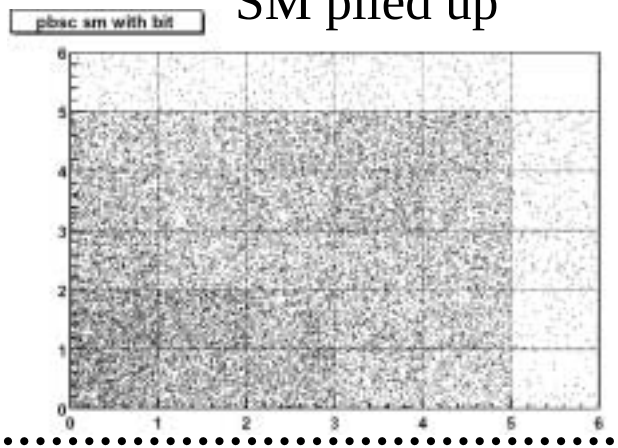
6 PbSc sector piled up

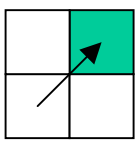
SM piled up



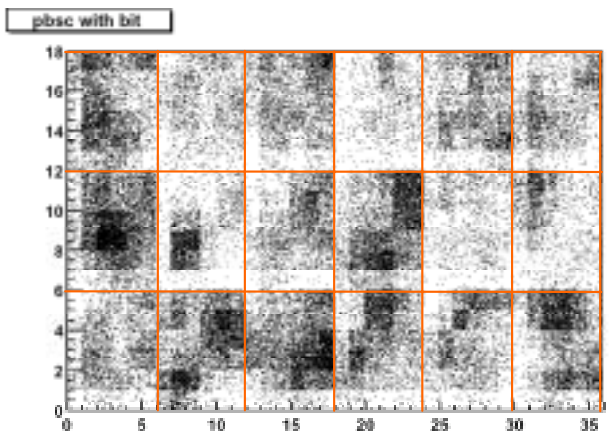
4x4 tile sum convention

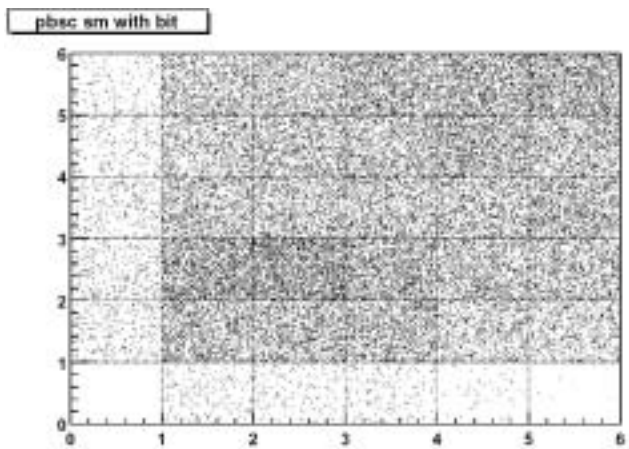






4x4 tile sum convention





This should be flat distribution if SMs were connected.

To calculate the particle yield from triggered data

we have to know

- Dead (masked) channel
- Response

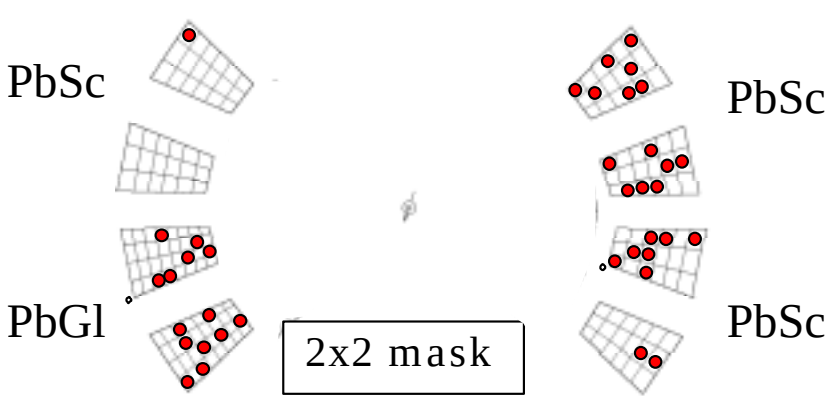
Hot channel mask

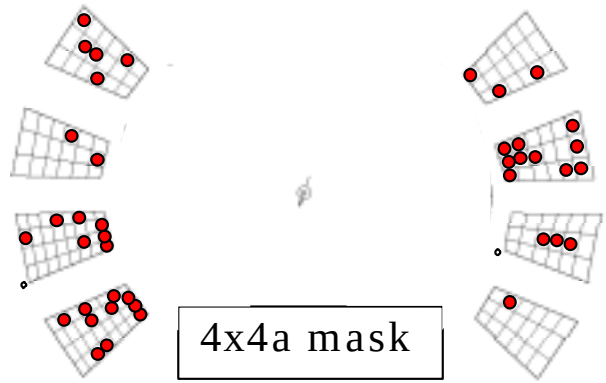
In 2002 Spin run

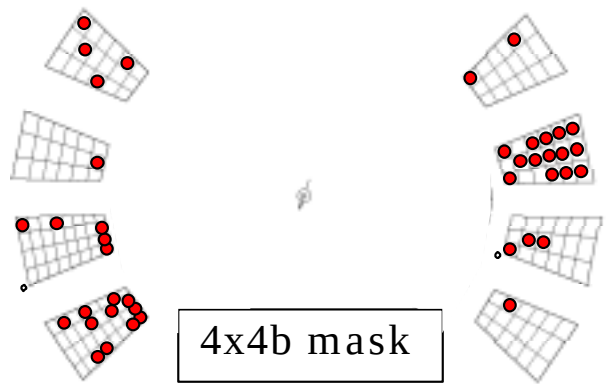
Unit= super module (SM)

144 PMTs in a SM

●: masked SM







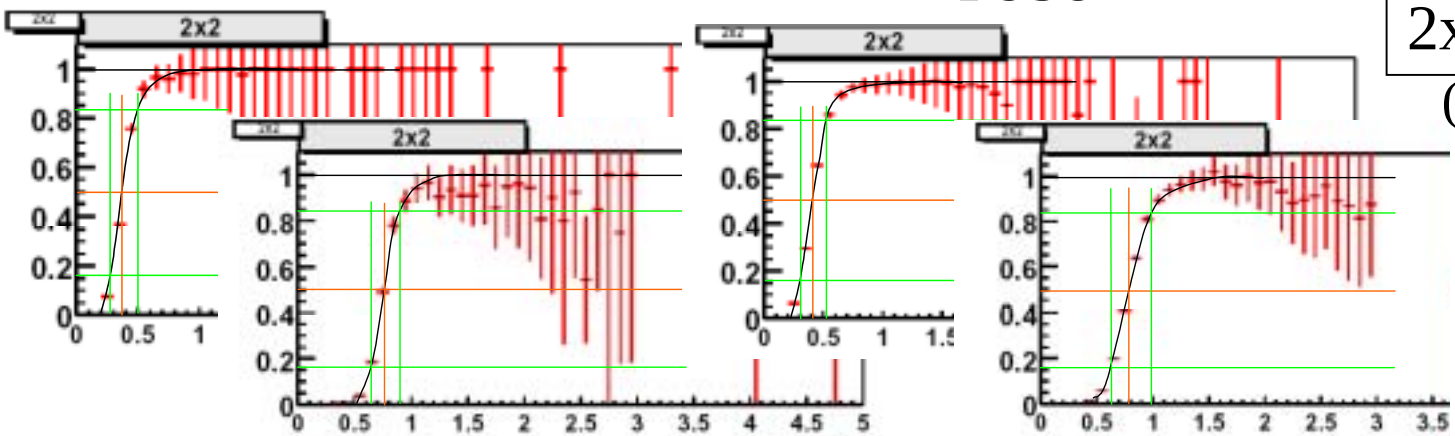
~75% is alive

These information is stored in PHENIX database

EMCal trigger turn on curve

PbGl

PbSc

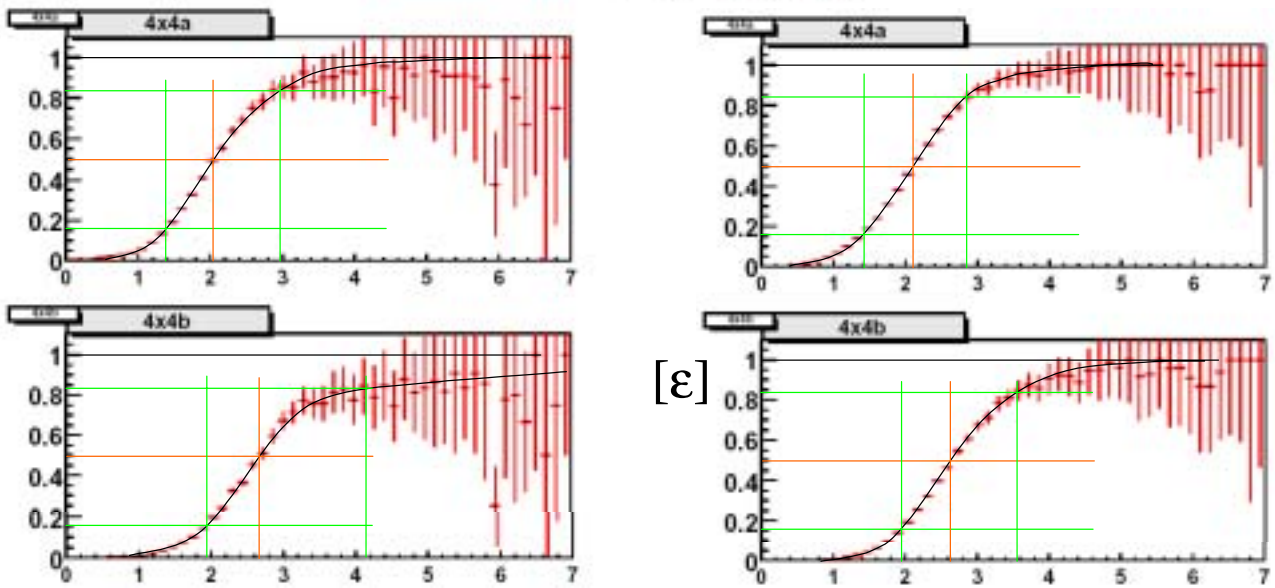


2x2

(two setting periods)

0.4GeV

and 0.8GeV



4x4a 2.1GeV

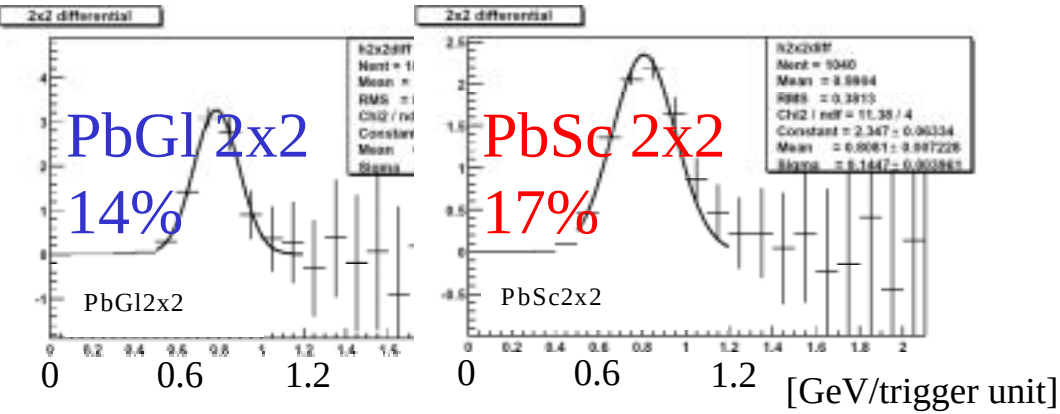
4x4b 2.7GeV

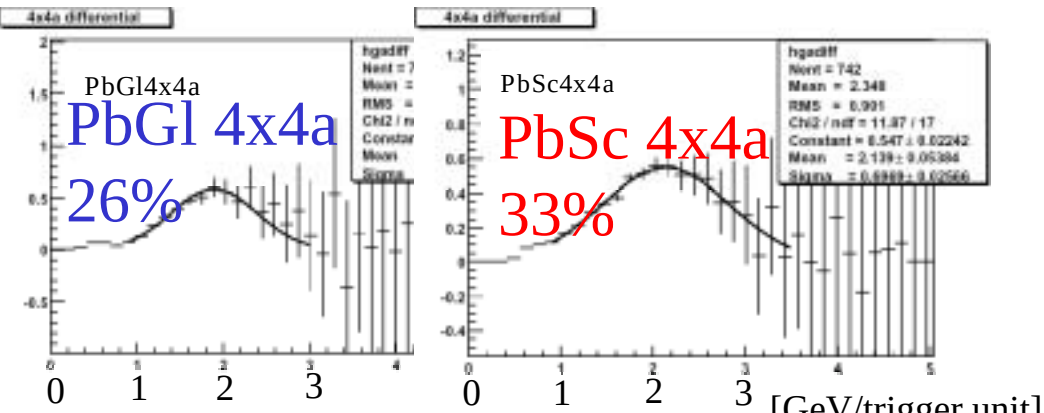
[ε]

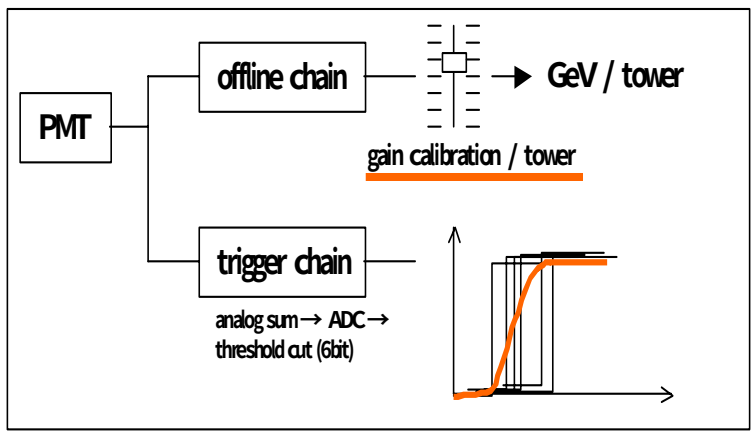
[GeV/trigger unit]

(calculated in the offline)

Width of turn on curve



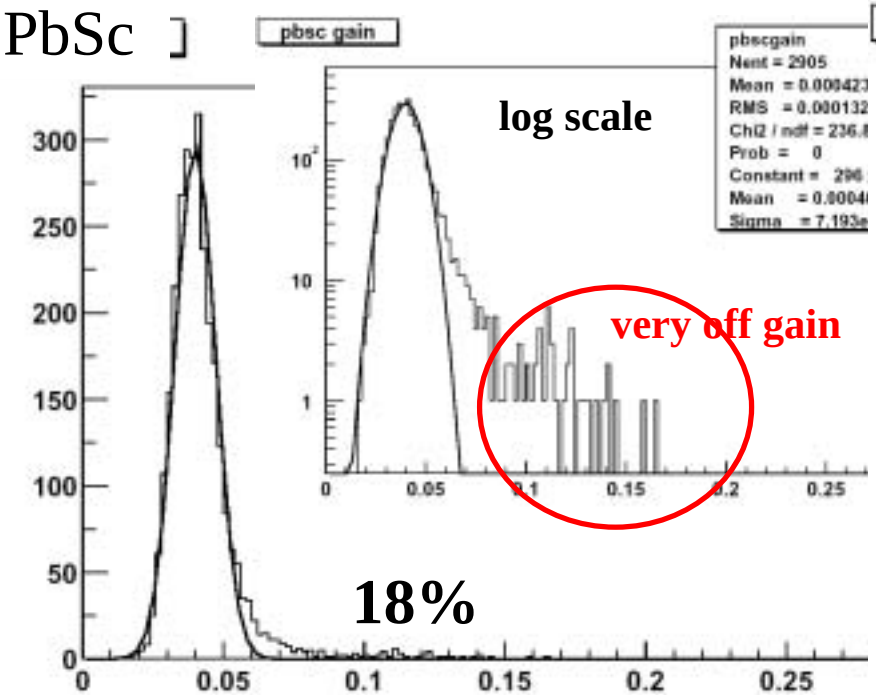




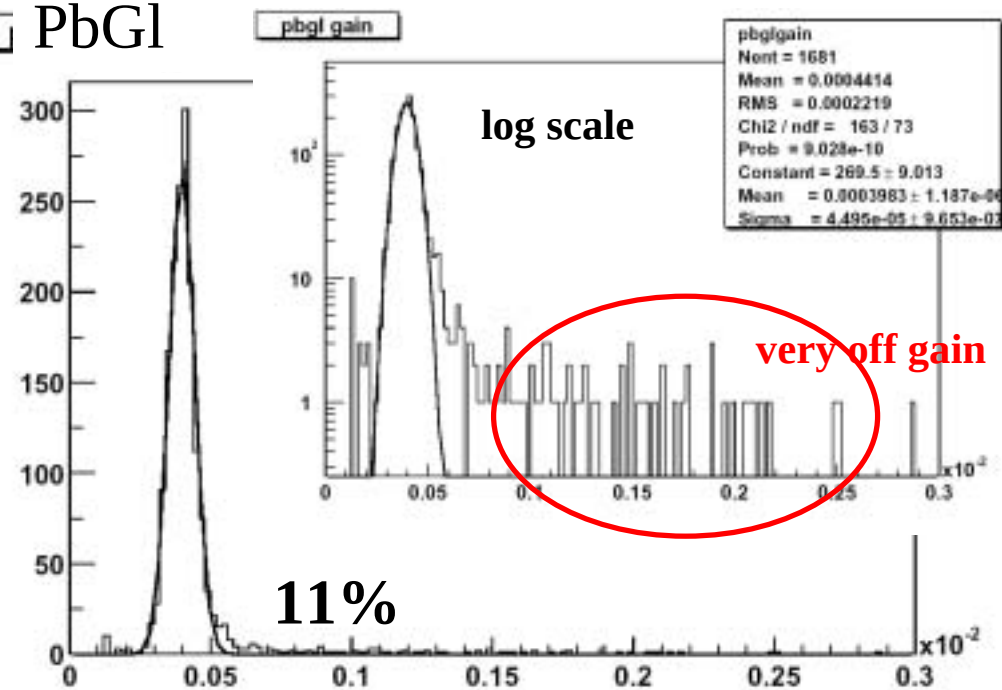
One reason of wide turn on curve is PMT gain variance

PMT gain variance (extracted from calibration parameter)

PbSc



PbGl



PbGl has better shape than PbSc.

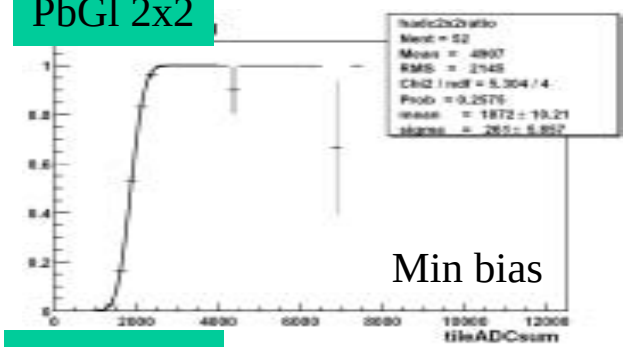
Both of them have some very off gain PMT.

(Some of them were not used in the last plots as a offline mask)

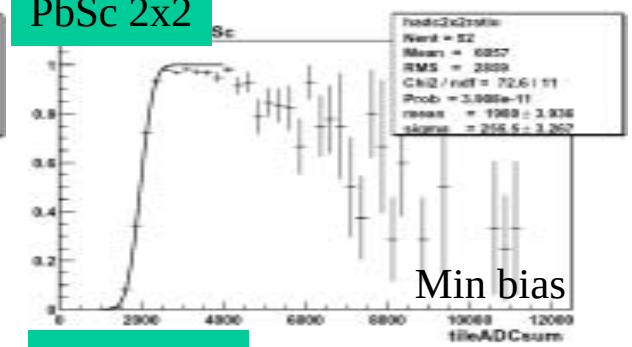
Trigger turn on curve for ADC value

To reject gain variance effect. Only “noise” appears.

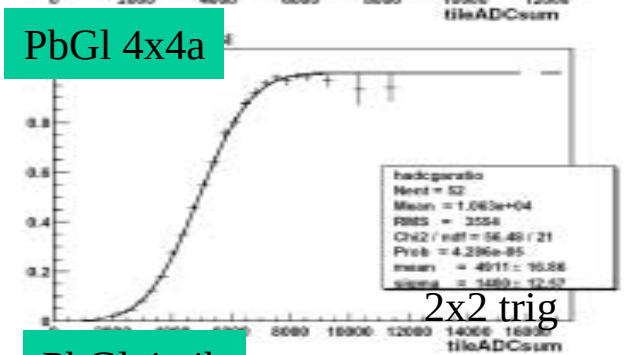
PbGl 2x2



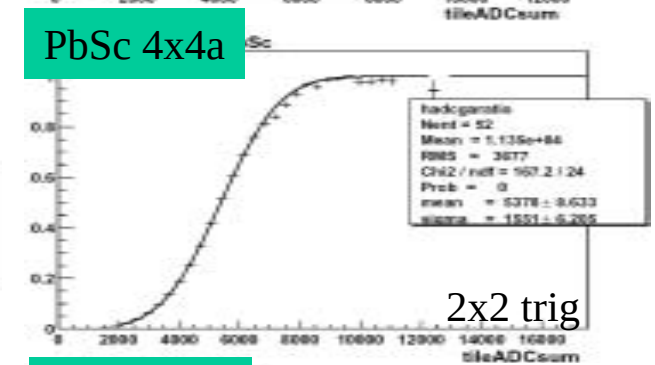
PbSc 2x2



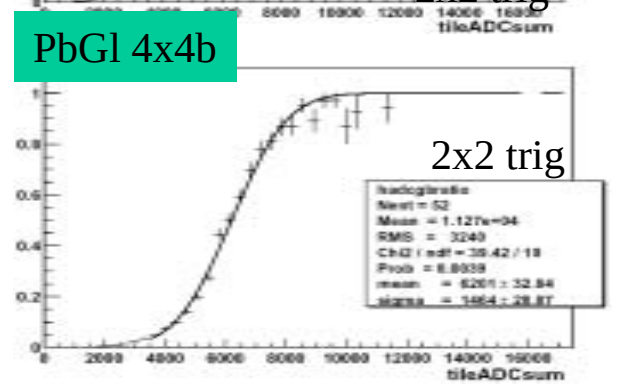
PbGl 4x4a



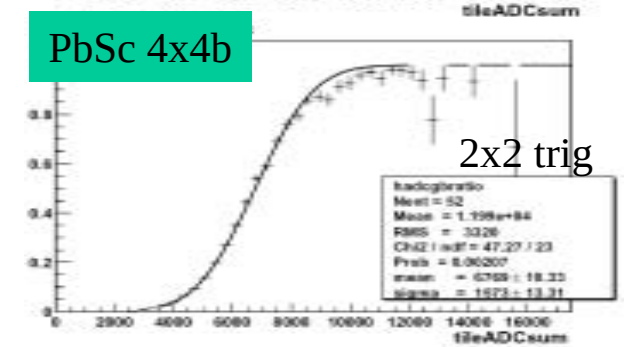
PbSc 4x4a



PbGl 4x4b



PbSc 4x4b



[ΣADC/trigger unit]

Integrated gaussian fits well

Fitting results

Trigger and detector	Mean (ADC value)	Width (ADC value)		Threshold* [GeV]	Width* [GeV]
2x2 PbGl	1872	261 (14%)		0.75	0.10
2x2 PbSc	1980	256 (13%)		0.79	0.10
4x4a PbGl	4911	1400 (29%)		2.0	0.56
4x4a PbSc	5378	1551 (29%)		2.2	0.62
4x4b PbGl	6201	1464 (24%)		2.5	0.59
4x4b PbSc	6769	1573 (23%)		2.7	0.63

) E[GeV]=0.0004(ADC value)

- Those show a factor besides gain variation. (noise?)
- PbGl and PbSc look consistent.

Summary

———For 2002 spin run analysis

input mask, gain variance + “noise”

———For 2003 spin run

· connect SMs of PbSc

· adjust gain of very off gain PMT

(For almost PMT, adjustment isn’t so effective)

· investigate what causes hot channel

· mask hot channel by each PMT unit

·rejection power should be safe

(×10 luminosity, ×10 ATP capability)

· investigate whether “noise” depend on the threshold for the future run